Amendments to the Claims

1 (currently amended): A coil configuration for a magnetic resonance imaging system, comprising:

a pair of coils in an opposite rotation orientation associated with a first magnetic field in a region of interest, wherein the region of interest is essentially within a cylinder created by the pair of coils~~wherein the first magnetic field and the second magnetic field are substantially parallel in the region of interest~~; and

a single coil associated with a second magnetic field in the region of interest, wherein the first magnetic field and the second magnetic field are substantially parallel in the region of interest, wherein the single coil is positioned at an essentially zero-flux contour with respect to the first magnetic field.

B1
Cont

2 (original): The configuration according to claim 1, further comprising:

a means for utilizing the pair of coils for detecting the first magnetic field; and a means for utilizing the single coil for detecting the second magnetic field.

3 (original): The configuration according to claim 1, further comprising:

a means for utilizing the pair of coils for generating the first magnetic field; and a means for utilizing the single coil for generating the second magnetic field.

4 (original): The configuration according to claim 2, further comprising:

a means for utilizing the pair of coils for generating the first magnetic field; and

a means for utilizing the single coil for generating the second magnetic field.

5 (original): The configuration according to claim 2, wherein said coils of said pair of coils and said single coil are selected from the group consisting of: a single turn loop, a multiturn solenoid wound as series loops, and a multiturn solenoid wound as parallel loops.

6 (original): The configuration according to claim 1, wherein each of said pair of coils and said single coil lie in planes parallel to each other, and wherein said essentially zero-flux contour is an essentially zero-flux plane.

7 (currently amended): The configuration according to claim 6, ~~wherein the region of interest is essentially within a cylinder created by the pair of coils, and~~ wherein the pair of coils and the single coil are co-axial.

8 (original): The configuration according to claim 2,

wherein the single coil is a first channel and the pair of coils is a second channel such that coupling between the first channel and second channel is low.

B1 Cont

9 (original): The configuration according to claim 8, wherein coupling between the first channel and second channel is approximately zero.

10 (currently amended): The ~~system~~ configuration according to claim 1, wherein the zero-flux contour is located between the pair of coils.

11 (currently amended): The ~~system~~ configuration according to claim 1, wherein the zero-flux contour is located outside the pair of coils.

12 (currently amended): The ~~system~~ configuration according to claim 10, wherein a second zero-flux contour with respect to the first magnetic field is located outside the pair of coils, further comprising a second single coil for generating a third magnetic field in the region of interest, wherein the second single coil is positioned at the second zero-flux contour with respect to the first magnetic field.

13 (original): The configuration according to claim 10,

wherein the single coil is positioned approximately equidistance from each of the pair of coils.

14 (original): The configuration according to claim 10, wherein the single coil is positioned closer to one of the coils of the pair of coils than to the other.

15 (original): The configuration according to claim 1, further comprising:

at least one Helmholtz coil pair associated with a third magnetic field essentially orthogonal to the first and second magnetic fields in the region of interest.

16 (original): The configuration according to claim 15, further comprising a means for utilizing said at least one Helmholtz coil pair for generating the third magnetic field.

17 (original): The configuration according to claim 15, wherein said Helmholtz coil pair is of a configuration selected from the group consisting of: large loops, top/bottom loops, side by side loops, and a combination thereof.

B1 Cont

18-24 (cancelled).

25 (original): The configuration according to claim 1,

wherein said pairs of coils are connected together by a pair of electrical conductors to form an Alderman-Grant coil pair.

26 (original): The configuration according to claim 1, further comprising:

a switching means for allowing the pair of coils and the single coil to operate in and switch between two or more of the modes in the group consisting of:

(i) the coils of the pair of coils and the single coil having currents rotating in the same direction;

(ii) the coils of the pair of coils having currents rotating in the same direction, with the single coil operating independently;

(iii) the coils of the pair of coils having currents rotating in opposite directions, with the single coil operating independently; and

(iv) the coils of the pair of coils having currents rotating in the same direction and the single coil having a current rotating in an opposite direction with respect to the currents of the pair of coils.

27-35 (cancelled).

36 (original): The configuration according to claim 1, further comprising:

at least one additional pair of coils, wherein said pair of coils in an opposite orientation has odd symmetry with respect to a plane,

wherein each of said at least one additional pair of coils is associated with a corresponding at least one additional magnetic field,

wherein each of said at least one additional pair of coils has even symmetry with respect to the plane and is associated with one of said at least one additional magnetic field such that said single coil is a first channel, said pair of coils in an opposite orientation is a second channel, and each of said at least one additional pair of coils is an additional channel which is orthogonal to the first channel, second channel, and each of the other additional channels.

B1 Cont

37 (original): The configuration according to claim 1, further comprising:

at least one additional pair of coils, wherein said pair of coils in an opposite orientation has odd symmetry with respect to a plane,

wherein each of said at least one additional pair of coils is associated with a corresponding at least one additional magnetic field,

wherein each of said at least one additional pair of coils has odd symmetry with respect to the plane and is associated with one of said at least one additional magnetic field such that said single coil is a first channel, said pair of coils in an opposite orientation is a second channel, and each of said at least one additional pair of coils is an additional channel which is orthogonal to the first channel, second channel, and each of the other additional channels.

38 (currently amended): A RF coil configuration for a magnetic resonance imaging system, comprising:

~~a plurality of~~ at least five RF coils with bilateral symmetry, wherein the at least five RF coils are coaxial,

wherein said plurality of RF coils is associated with a plurality of modes such that the number of modes is less than or equal to the number of RF coils, wherein said plurality of modes correspond with a plurality of current patterns, each of said plurality of current patterns having zero net mutual inductive coupling to each of the other of said plurality of current patterns in a region of interest.

39 (previously amended): The configuration according to claim 38, further comprising:

a means for utilizing the plurality of RF coils for detecting magnetic fields associated with the plurality of current patterns.

B1 Cont

40 (previously amended): The configuration according to claim 38, further comprising:

a means for utilizing the plurality of RF coils for generating magnetic fields associated with the plurality of current patterns.

41 (currently amended): A method of detecting magnetic fields in a magnetic resonance imaging system, comprising the following steps:

detecting a first magnetic field in the field of interest utilizing a pair of coils in an opposite rotation orientation associated with the first magnetic field in a region of interest, wherein the first magnetic field and the second magnetic field are ~~essentially~~ substantially parallel in the region of interest, wherein the region of interest is essentially within a cylinder created by the pair of coils ; and

detecting a second magnetic field in the region of interest utilizing a single coil associated with the second magnetic field in the region of interest,

wherein the single coil is positioned at an essentially zero-flux contour with respect to the first magnetic field.

42-44 (cancelled).

45 (currently amended): A method of detecting magnetic fields in a magnetic resonance imaging system, comprising the following steps:

positioning ~~a plurality of~~ at least five RF coils coaxially with respect to a region of interest such that the plurality of RF coils support a plurality of modes corresponding to a plurality of current patterns; and

detecting the plurality of modes associated with the plurality of RF coils, wherein the number of RF coils is greater than or equal to the number of modes, and wherein each of the plurality of current patterns has zero net mutual inductive coupling to each of the other of the plurality of current patterns in a region of interest.

46 (new): The configuration according to claim 1, wherein the pair of coils and single coil are positioned with respect to an external static magnetic field such that the direction of the external static magnetic field is perpendicular to the axis of the cylinder created by the pair of coils.

47 (new): The configuration according to claim 36, wherein each of said pair of coils, said single coil, and each of said at least additional pairs of coils lie in planes parallel to each other.

48 (new): The configuration according to claim 47, wherein each of said pair of coils, said single coil, and each of said at least additional pairs of coils are coaxial.

49 (new): The configuration according to claim 49, wherein each of said pair of coils, said single coil, and each of said at least additional pairs of coils lie in planes parallel to each other.

50 (new): The configuration according to claim 37, wherein each of said pair of coils, said single coil, and each of said at least additional pairs of coils are coaxial.

51 (new): A method of detecting magnetic fields in a magnetic resonance imaging system, comprising:

positioning a pair of coils in an opposite rotation orientation, wherein the pair of coils are associated with a first magnetic field in a region of interest, wherein the region of interest is essentially within a cylinder created by the pair of coils;

positioning a single coil at an essentially zero-flux contour with respect to the first magnetic field, wherein the single coil is associated with a second magnetic field in the region of interest;

detecting the first magnetic field with the pair of coils; and

detecting the second magnetic field with the single coil.

52 (new): The method according to claim 51, further comprising positioning the pair of coils with respect to an external static magnetic field such that the direction of the external static magnetic field is perpendicular to the axis of the cylinder created by the pair of coils.

53 (new): The method according to claim 52, wherein positioning the pair of coils with respect to an external static magnetic field comprises positioning the pair of coils with respect to a vertical external static magnetic field.

54 (new): The method according to claim 51, further comprising:

positioning an object to be imaged in the region of interest.

55 (new): The method according to claim 51, wherein positioning an object to be imaged in the region of interest comprises positioning an object to be imaged such that at least a portion of the object is in the essentially zero-flux contour with respect to the first magnetic field.

56 (new): The method according to claim 55, wherein each of said pair of coils and said single coil lie in planes parallel to each other, and wherein said essentially zero-flux contour is an essentially zero-flux plane, wherein positioning an object to be imaged in the region of interest

comprises positioning an object to be imaged such that at least a portion of the object is in the essentially zero-flux plane.

57 (new): The method according to claim 54, wherein positioning an object to be imaged in the region of interest comprises inserting at least a portion of the object to be imaged into the region of interest through one of the pair of coils.

58 (new): The method according to claim 57, wherein positioning an object to be imaged in the region of interest further comprises inserting at least a portion of the at least a portion of the object to be imaged through the single coil.

59 (new): The method according to claim 51, further comprising generating the first magnetic field with the pair of coils; and generating the second magnetic field with the single coil.

60 (new): The method according to claim 51, wherein the single coil is a first channel and the pair of coils is a second channel such that coupling between the first channel and second channel is low.

61 (new): The method according to claim 60, wherein coupling between the first channel and second channel is approximately zero.

62 (new): The method according to claim 51, wherein the zero-flux contour is located between the pair of coils.

63 (new): The method according to claim 51, wherein the zero-flux contour is located outside the pair of coils, wherein the region of interest extends outside the pair of coils.

64 (new): The method according to claim 63, wherein a second zero-flux contour with respect to the first magnetic field is located outside the pair of coils, further comprising a second

single coil for generating a third magnetic field in the region of interest, wherein the second single coil is positioned at the second zero-flux contour with respect to the first magnetic field.

65 (new): The method according to claim 62,

wherein the single coil is positioned approximately equidistance from each of the pair of coils.

66 (new): The method according to claim 62, wherein the single coil is positioned closer to one of the coils of the pair of coils than to the other.

67 (new): The method according to claim 51, further comprising:

positioning at least one Helmholtz coil pair, wherein the at least one Helmholtz coil pair is associated with a third magnetic field essentially orthogonal to the first and second magnetic fields in the region of interest; and detecting the third magnet field with the at least one Helmholtz coil pair.

B1 Cont

68 (new): The method according to claim 67, further comprising utilizing said at least one Helmholtz coil pair for generating the third magnetic field.

69 (new): The method according to claim 67, wherein said Helmholtz coil pair is of a configuration selected from the group consisting of: large loops, top/bottom loops, side by side loops, and a combination thereof.

70 (new): The method according to claim 51,

wherein said pairs of coils are connected together by a pair of electrical conductors to form an Alderman-Grant coil pair.

71 (new): The method according to claim 51, further comprising:

providing a switching means for allowing the pair of coils and the single coil to operate in and switch between two or more of the modes in the group consisting of:

(i) the coils of the pair of coils and the single coil having currents rotating in the same direction;

(ii) the coils of the pair of coils having currents rotating in the same direction, with the single coil operating independently;

(iii) the coils of the pair of coils having currents rotating in opposite directions, with the single coil operating independently; and

(iv) the coils of the pair of coils having currents rotating in the same direction and the single coil having a current rotating in an opposite direction with respect to the currents of the pair of coils.

72 (new): The method according to claim 51, further comprising:

positioning at least one additional pair of coils, wherein said pair of coils in an opposite orientation has odd symmetry with respect to a plane, wherein each of said at least one additional pair of coils is associated with a corresponding at least one additional magnetic field; and detecting the corresponding at least one additional magnetic field with the corresponding at least one additional pair of coils,

wherein each of said at least one additional pair of coils has even symmetry with respect to the plane and is associated with one of said at least one additional magnetic field such that said single coil is a first channel, said pair of coils in an opposite orientation is a second channel, and each of said at least one additional pair of coils is an additional channel which is orthogonal to the first channel, second channel, and each of the other additional channels.

73 (new): The method according to claim 72, wherein each of said pair of coils, said single coil, and each of said at least additional pairs of coils lie in planes parallel to each other.

74 (new): The method according to claim 73, wherein each of said pair of coils, said single coil, and each of said at least additional pairs of coils are coaxial.

75 (new): The method according to claim 57, further comprising:

positioning at least one additional pair of coils, wherein said pair of coils in an opposite orientation has odd symmetry with respect to a plane, wherein each of said at least one additional pair of coils is associated with a corresponding at least one additional magnetic field; and detecting the corresponding at least one additional magnetic field with the corresponding at least one additional pair of coils,

wherein each of said at least one additional pair of coils has odd symmetry with respect to the plane and is associated with one of said at least one additional magnetic field such that said single coil is a first channel, said pair of coils in an opposite orientation is a second channel, and each of said at least one additional pair of coils is an additional channel which is orthogonal to the first channel, second channel, and each of the other additional channels.

76 (new): The method according to claim 75, wherein each of said pair of coils, said single coil, and each of said at least additional pairs of coils lie in planes parallel to each other.

77 (new): The method according to claim 76, wherein each of said pair of coils, said single coil, and each of said at least additional pairs of coils are coaxial

78 (new): A method of coil configuration for a magnetic resonance imaging system, comprising:

positioning a plurality of coils with bilateral symmetry, wherein said plurality of coils is associated with a plurality of modes such that the number of modes is less than or equal to the number of coils, wherein said plurality of modes correspond with a plurality of current patterns, each of said plurality of current patterns having zero net mutual inductive coupling to each of the other of said plurality of current patterns in a region of interest; and

detecting magnetic fields associated with the plurality of modes with the plurality of RF coils.